



WASHINGTON STATE
DEPARTMENT OF
E C O L O G Y

Nephelometer Procedure

Air Quality Program

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**State of Washington
Department of Ecology
Air Quality Program**

NEPHELOMETER PROCEDURE

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February 2001

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1 INTRODUCTION

This document describes the procedures used to sample the visual quality of ambient air using the M903 portable nephelometer by the Washington State Department of Ecology Air Quality Program.

This document is intended to be used together with the sampler-specific information and instructions provided by the manufacturer.

1.1 Theory of Operation

The nephelometer measures the visual quality of local ambient air. This is accomplished by measuring the scattering of light due to particulates in the air sample. The nephelometer is an instrument that measures aerosol particle concentration in terms of the light scattering optical extinction coefficient, b_{ext} . It detects scattering properties by measuring light scattered by the aerosol and subtracting light scattered by the gas, the walls of the instrument and the background noise in the detector.

The property that the nephelometer measures is the extinction of light over a distance. Extinction is caused by both scattering and absorption of light by particles. The extinction coefficient b_{ext} is a measure of these, and is given by the formula

$$b_{\text{ext}} = b_{\text{scat}} + b_{\text{abs}} = \ln(I/I_0)/x$$

Where,

x = length of light path

I = intensity of light after distance

I_0 = initial intensity of light

b_{scat} and b_{abs} are the scattering and absorption coefficients. They are each divided into two components.

$$b_{\text{scat}} = b_{\text{rg}} + b_{\text{sp}}$$

$$b_{\text{abs}} = b_{\text{ag}} + b_{\text{ap}}$$

b_{rg} = Rayleigh (gas) scattering coefficient

b_{sp} = particle scattering coefficient

b_{ag} = gas absorption coefficient

b_{ap} = particle absorption coefficient

The nephelometer measures b_{scat} and b_{rg} and subtracts b_{rg} from b_{scat} to get b_{sp} . b_{ag} is usually negligible.

The equation derived by Middleton (1958) and Butcher and Charlson (1972) that governs the instrument is

$$B = (I_0/y) * (b_{\text{scat}}/2\pi)$$

y = vertical distance from light source to sensor

B = flux of light detected by sensor

The nephelometer counts photons using the photomultiplier tubes. The photon counts are converted to counting frequencies and then scattering coefficients using calibration constants.

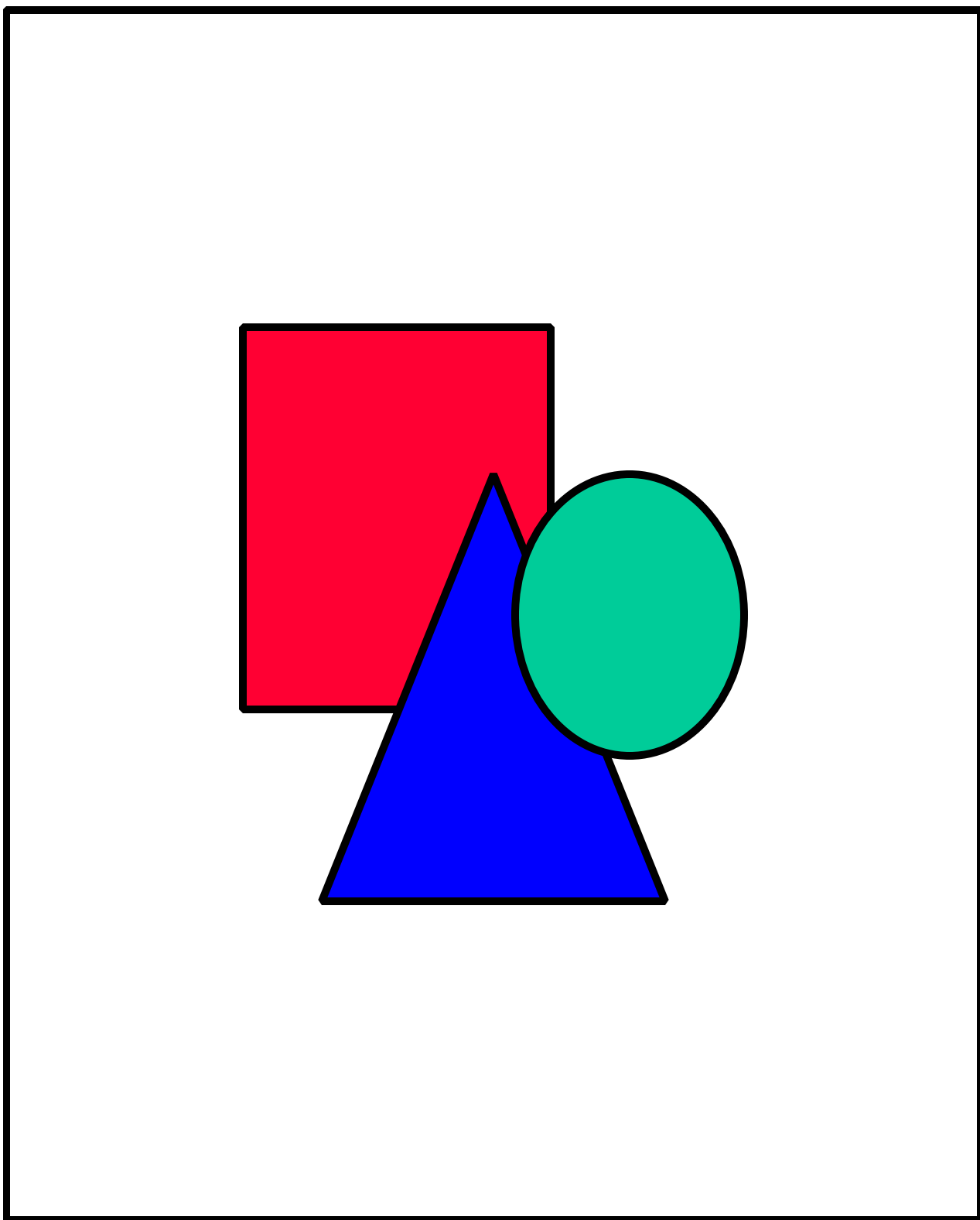


Figure 1-1 Schematic Diagram of M903 Nephelometer and Panel Display

2 EQUIPMENT & SUPPLIES

- The M903 Nephelometer.
- Data logger
- Additional parts and supplies.
- Calibration equipment as defined in Section 4.3.1.
- soft brushes & cotton swabs, Kim wipes, and worksheets.
- Logbook

3 SITING REQUIREMENTS AND INSTALLATION CONSIDERATIONS

Nephelometers are usually sited for measuring visual quality of ambient air or to estimate particulate matter concentrations if collocated with a PM_{2.5} FRM sampler. If the Nephelometer is collocated with a PM_{2.5} FRM sampler then in most cases siting criteria will have already been met. The nephelometer can be installed at the site in a shelter or in the monitoring station. Complete siting criteria are presented in 40 CFR 58, Appendix E.

If the nephelometer is being sited for the purpose of measuring visual air quality, siting criteria for IMPROVE aerosol sampling should be used (IMPROVE SOP 126, 09/12/96).

Several additional factors must also be considered in determining placement of the nephelometer. Accessibility under all weather conditions, availability of adequate and stable power source of 110 Volt, security of the personnel and equipment must be taken into consideration.

The nephelometer must be situated where the operator can reach it safely despite adverse weather conditions. It should be located so that the operator can operate the nephelometer without rain or snow impeding. If the nephelometer is located on a rooftop, care should be taken that the operator's personal safety is not jeopardized by a slippery roof surface during inclement weather. Consideration also should be given to the fact that routine operation such as calibrations and QC checks involves transporting supplies and equipment to and from the site.

The security of the nephelometer itself depends mostly on its location. Rooftop sites with locked access and ground-level sites with fences are common. The security of the operating personnel, as well as that of the nephelometer must always be considered.

3.1 Installation of a Nephelometer

This section discusses the installation of nephelometer.

- 1) On receipt of a nephelometer, visually inspect it to ensure that all components are accounted for. Notify the Monitoring Unit immediately of any missing or damaged equipment. The probe length shall not exceed 30´.
- 2) Carefully transport the nephelometer to the field site. Secure the nephelometer in its location keeping it level.

- 3) Ensure that the Power switch is *Off*. Install the unit by applying power to the power jack with the supplied wall converter.
- 4) Connect vacuum to the outlet port. If using the auxiliary fan, it connects directly to the outlet port using 0.5 " PVC pipe.
- 5) Turn the power switch to *On* position. The nephelometer should start pulsing about 2 seconds later. Observe the flash from the strobe lamp through the top inlet port to ensure that the instrument is operating. The Main screen is displayed on the front panel after a series of flashes.
- 6) The display panel will display information regarding
 - a) B_s = Scattering coefficient in unit m^{-1} .
 - b) t_c = Data average time constant in seconds.
 - c) Slow Mode: Operation Mode.
 - d) Time and Date
 - e) Relay contact status :

3.1.1 System Operation and Setup of internal data storage

The Monitoring unit will set the instrument to automatically measure and utilize the necessary parameter for internal data storage, Rayleigh Scattering Coefficient, diagnostic parameters and channel settings of four analog outputs.

4 FIELD OPERATIONS

This section presents information pertinent to the routine operation of the nephelometer. It covers an array of topics, including nephelometer installation, calibration, calibration check, and sampling operations.

4.1 Sampling Operations

This section describes the operation of the M903 nephelometer including topics such as verifying the instrument zero and span parameters and calibration procedure.

After the station installation is completed, turn the instrument ON by pressing the “Power” button on the front panel of the Control Unit. A screen appears on the instrument’s four line display showing the name of the instrument and then the Main Screen appears.

Turn on the pump to draw the sample stream through the system. The panel display and display switches will be used to operate the nephelometer and change certain parameters. There are eight user accessible screens. The panel display is menu driven and individual operation screens are accessed with the Display switch. Zero and span adjustments are set from the screens as well as default mode selection and internal operation data can be monitored from the display as well.

4.2 Discussion Of General Aspects Of Calibration

This section describes the procedures involved in calibration of the nephelometer. The procedure used for calibrating the nephelometer are the same for initial calibration of a newly installed instrument as those used for the weekly Quality Control calibration checks of a working nephelometer. The instrument is calibrated using two "span gases" with different known scattering properties.

Calibration is accomplished by filling the instrument with gases of known but different scattering coefficients and adjusting the zero and span constants for the appropriate scattering values. Particle free air is used as a zero reference scatterer and R-134 is used as an upscale scatterer. This is described in detail below.

4.3 Basic Calibration Procedure For A Nephelometer

4.3.1 Calibration Equipment

- A clean air filter.
- A sample pump.
- A supply of R-134 gas.
- Rotameter.
- Table 4.2 Nephelometer Zero/Span Verification and Calibration Log Sheet.

4.3.2 Zero Drift Calibration and Span Calibration

This section describes the Zero Drift procedure and Span Calibration. The Zero drift calibration allows setting the instrument zero when particle free air is flowing through the instrument. The Span calibration allows setting the instrument span when a calibration gas is flowing through the instrument.

- 1) Disable the station data logger channel.
- 2) From Main Screen (this is Screen # 1) record tc and mode on the log sheet. Change to the Fast operation mode during calibration by using the Display switch to change to the Mode menu then use Item-slow to change to Fast. Turn the power switch 'Off' then back to 'On' to record the mode change.
- 3) Record the nephelometer display value for bs under 'Operator notes' on the log sheet. Then record the data logger instantaneous value for bs in VDC. This is for comparing the values displayed by the nephelometer and the data logger. The purpose of this step is to record the value of ambient air before any changes are made to the system.

NOTE: If the nephelometer is switched to the fast mode, it should be returned to the slow mode prior to ambient air sampling.

4.3.2.1 Zero Calibration Check

- 4) Turn Off the pump and remove the ambient air probe and connect zero air filter to the inlet. Now turn the pump On after the filter is inserted.
- 5) Advance to Zero Calibration Screen (screen # 3). Record the values for den, zden, zero and set ZERO on the log sheet under screen # 3 .
- 6) Advance to Photomultiplier Adjust and Diagnostic Screen (screen # 5) and record on the log sheet the dark current, flash lamp, reference voltage and high voltage in the appropriate row on the log sheet.
- 7) While the ambient pump is on, toggle the 'Display' switch on the nephelometer to the Set Air Rayleigh Scattering Coefficient, Pressure Temperature and Rh display screen. This is Screen #6 when the Main Screen is counted as Screen #1. Record the information from this screen on the Log sheet under Screen #6. Record the Pressure, Temperature, Rh and @STP which is the Air Rayleigh scattering coefficient at $\lambda = 530$ nm and at standard temperature and pressure. Also record 'set Rsct' on the log sheet.
- 8) Advance to Calibration Gas Screen (screen #7). Record on the log sheet the values for 'Calgas/rayair ratio' and 'set Rgas' values.
- 9) Return to Zero Calibration Screen (screen # 3). After the zero air has stabilized, in about 10 – 15 minutes, note the value of bscat on the nephelometer display and record this value on the log sheet under 'Clean Air Zero Initial Value' (Bscat). Also record the voltage from the datalogger as "Clean Air Zero Initial Value (VDC)". If the zero value is less than $-0.5E-5$ or greater than $0.5E-5$ then a zero adjustment must be made later on as discussed below in step 12.

4.3.2.2 Span Calibration Check

- 10) Turn Off the pump and remove the pump probe or fan from the outlet side of the nephelometer. This is very important because the chamber will not fill with R134 if the pump is On. Leave the zero air filter in place for a restriction. Try to vent the R134 out the inlet probe to the outside air. Block the outlet with a stopper cap and connect the tube from the span gas tank (R134) to the purge port at the base of the nephelometer. Blow the span gas R134 through the purge port at the rate of 2 lpm to fill the column. It is important that the entire column is filled since the refractive index of the span gas is different from air. Allow 15-20 minutes to fill and stabilize with span gas.
- 11) Press the Display key until the Span Calibration Screen (Screen 4) is displayed. Note and record on the log sheet the gas, span, wall and set SPAN values. Also, record the gas value on the log sheet at "Bscat Calculated Set Point". Then note the value at bscat and record this value on the log sheet as the Span Gas Initial Value (Bscat). Record the voltage from the datalogger as "Span Gas Initial Value (VDC)". At this point the operator will return to screen 6 and note the Pressure, Temperature and Rh at the top of the log sheet.
- 12) If initial span gas value is more than 7% different from bscat Calculated Set Point then press and release Reset –average to check that the bscat value on the Span Calibration Screen (Screen 4) and wait for the value to stabilize. Adjust the bscat value by holding the Item switch up (for faster

adjustment) or down (for slower adjustment) while operating the Parameter – raise or lower. Adjust until bscat value (first value on Screen 4) is within 5% of “bscat Calculated Set Point” (2nd value on the panel screen “gas”). Record on the log and chart as “Span Gas Adjusted Value”. Also record this value as set SPAN Gas Initial value.

- 13) Turn off the R134 gas and remove the tubing from the purge port. Plug the stopper in the purge port and remove stopper from outlet port. Adjust Zero at this time if needed, otherwise return the nephelometer to “SLOW” mode prior to sampling. Reconnect the ambient pump probe to the outlet port. Turn the ambient pump on.
- 14) If zero adjustment is needed then follow the steps below.
- 15) Attach the clean air filter apparatus (zero filter) into the inlet.
- 16) Press Display until the Zero screen (Screen # 3) is displayed.
- 17) Reconnect pump.
- 18) Press and release Reset-average to purge the memory buffer and decrease the time necessary for the nephelometer to display a valid average. Wait for the bscat value to stabilize. Adjust the zero offset by holding the Item switch up (for faster adjustment) or down (for slower adjustment) while operating the Parameter – raise or lower to add or subtract offset. Adjust until bscat value is $\pm 0.5E-5$. Allow to stabilize.
- 19) Record set ZERO as new set ZERO and dlog voltage in the Calibration form.
- 20) Turn off the ambient pump and disconnect the clean air filter apparatus.
- 21) Return to manufacturer and model identification screen. Reconnect the ambient probe and return the nephelometer to “SLOW” mode before resuming ambient air monitoring
- 22) Enable the data logger.

4.4 Nephelometer Calibration Criteria

Table 4-1, below summarizes the calibration check criteria.

Table 4-1 Calibration Check Criteria

Parameter	Acceptance Criteria
Zero	Greater than $-0.5E-5$ and less than $0.5E-5$
Span	Less than 5% from Bscat Calculated Set Point
Time	± 1 minute

Table 4-2 Nephelometer Zero/Span Verification and Calibration Log Sheet

Station Name: _____ Station Number: _____

Analyzer State Tag Number: _____ Analyzer S/N: _____

Shelter Temperature: Max _____ Min _____ Curr _____

Bscat Calculated Set Point (Gas) _____ Bscat P = _____ T = _____ Rh = _____

Initial Value

Adjusted Value

Clean Air Zero (Bscat) _____

(VDC) _____

Span Gas Bscat) _____

(VDC) _____

Screen #1 tc _____

mode _____

Screen #3 bscat _____

den _____

zden _____

zero _____

set ZERO _____ > _____

Screen #4 bscat _____

gas _____

span _____

Wall _____

set SPAN _____ > _____

Screen # 5 dark _____

lamp _____

ref v _____

high v _____

Screen # 6 @STP _____

P _____

T _____

Rh _____

set Rsct _____ > _____

Screen # 7 calgas/rayair ratio _____

set Rgas _____

Operator Notes:

Start check at _____ PST

End check at _____ PST

By: _____

Date: _____

Table 4-3 Calibration and Calibration Check Intervals

Activity	Frequency	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Acceptance Criteria
Zero Drift Check	Once in 10 days													Greater than -0.5E-5 and less than 0.5E-5
Span Check	Once in 10 days													Less than 7% from Bscat Calc. Set Pt.
Time	Once in 10 days													1 min/month
Zero Calibration	As needed													Greater than -0.5E-5 and less than +0.5E-5
Span Calibration	As needed													Less than 7% from Bscat Calc. Set Pt.
Wall	Once in 10 days													Less than 80%

4.5 Data Retrieval From The Data Logger

This section discusses the steps to retrieve data from the data logger. Data retrieval will be done during weekly visits to the site.

4.5.1 Download Data

- 1) Ensure communication is set up between the electronic device of choice and that the communication parameter between the electronic device and the data logger agrees.
- 2) Download the data from the data logger using the appropriate ESC milker software. This will depend on the model of data logger that is at the site. The appropriate name for a downloaded file will be as follows: tmpf (2 character DCN ID).dat. For example, a downloaded file from a site with a DCN ID of 'ZZ' will be named as: tmpf1zz.dat.
- 3) View the raw data that has been downloaded at the site to ensure that all the data has been properly downloaded and that the file is named correctly. If ESC milker software or other communication device does not name the file automatically in appropriate form, the operator will rename the downloaded file in the correct format (see above).
- 4) When the operator returns to the office, transfer all the files collected that day to the desktop computer. Storing the data permanently on the portable PC is not recommended because of its storage limitations and the potential for losing the data due to battery failure.
- 5) Email the data files to AIRS Coordinator in Lacey weekly or send a floppy 3 1/2" diskette via campus mail. If the operators chooses to mail the diskette, then fill out a "Data Milker/Processing Log" and send it with the diskette. Make sure that the email includes the site's DCN ID and the date the data was downloaded and the inclusive dates of the data contained in the file.

5 QUALITY CONTROL

Essential to acquiring quality data are scheduled visits to the monitoring station to verify the operational status of the nephelometer. Weekly Quality Control visits are made to the station to inspect the site, the nephelometer and other monitoring equipment that is present at the site. These visits will include performing a precision check, completing the Nephelometer Zero/Span Verification and Calibration Log sheet presented in Table 4.2, and if necessary performing calibrations and adjustments for zero and span.

All operational activities performed on-site should be entered into the site specific instrument logbook. The logbook is to remain on-site. Problems should be identified and corrected immediately. It is imperative to document all changes and conditions in the logbook. Ensure the Monthly Average Report and Monthly Precision Check Summary Form is filled in and mailed to Quality Assurance Unit by the 10th of month following the month in which the data was collected.

5.1 Precision Check

As part of the weekly visit to the monitoring station a precision check must be performed. This is done in conjunction with completing the Nephelometer Zero/Span Verification and Calibration Log sheet presented in Table 4.2. When performing a precision check no adjustments are to be made prior to the check. Adjustments will result in an invalid check. For a blank Precision Check form see Section 8. The table below defines the criteria for the precision checks.

Check	Control limit	Corrective Action
Weekly Span	$>\pm 7\%$	Adjust Analyzer
	$> \pm 10\%$	Rectify problem and Invalidate Data
Weekly Zero	$>\pm 0.5E-5$	Adjust Analyzer
	$>\pm 2\%$ of Full Scale	Rectify problem and Invalidate Data

Perform the following steps for the precision check

- 1) Disable the station data logger channel.
- 2) From Main Screen (Screen # 1) record tc and mode on the log sheet. Change to the Fast operation mode by using the Display switch to change to the Mode menu then use Item-slow to change to Fast. Turn the power switch 'Off' to 'On'.

NOTE: If the nephelometer is switched to the fast mode, it should be returned to the slow mode prior to ambient air sampling.

5.1.1.1 Zero Precision Check

- 3) Turn off the pump and remove the ambient air probe and insert zero air filter into the inlet. Now turn the pump On after the filter is inserted.
- 4) Advance to Zero Calibration Screen (screen # 3). Record the values for den, zden, zero and set ZERO on the log sheet under screen # 3 .
- 5) Advance to Photomultiplier Adjust and Diagnostic Screen (screen # 5) and record on the log sheet the dark current, flash lamp, reference voltage and high voltage in the appropriate row on the log sheet.
- 6) While the ambient pump is on, toggle the 'Display' switch on the nephelometer to the Set Air Rayleigh Scattering Coefficient, Pressure Temperature and Rh display screen. This is Screen #6 when the Main Screen is counted as Screen#1. Record the information from this screen on the Log sheet under Screen #6. Record the Pressure,

Temperature, Rh and @STP which is the Air Rayleigh scattering coefficient at $\lambda = 530$ nm and at standard temperature and pressure. Also record 'set Rsct' on the log sheet.

- 7) Next record the nephelometer display value for bs under 'Operator notes' on the log sheet. Then record the data logger instantaneous value for bs in VDC. This is for comparing the values displayed by the nephelometer and the data logger.
- 8) Advance to Calibration Gas Screen (screen #7). Record on the log sheet the values for 'Calgas/rayair ratio' and 'set Rgas' values.
- 9) Return to Zero Calibration Screen (screen # 3). After the zero air has stabilized, note the value of bscat on the nephelometer display and record this value on the log sheet under 'Clean Air Zero Initial Value'. If the zero value is less than $-0.5E-5$ or greater than $0.5E-5$ then a zero adjustment must be made later on, as discussed in Section 4.3.

5.1.1.2 Span Precision Check

- 10) Turn Off the pump and remove the ambient probe from the outlet side of the nephelometer. This is very important because the chamber will not fill with R134 if the pump is On. Leave the zero air filter in place for a restriction. Try to vent the R134 out the inlet probe to the outside air. Block the outlet with a stopper cap and connect the tube from the span gas tank (R134) to the purge port at the base of the nephelometer. Blow the span gas R134 through the purge port at the rate of 2 lpm to fill the column. It is important that the entire column is filled since the refractive index of the span gas is different from air. Allow 15-20 minutes to fill and stabilize with span gas.
- 11) Press the Display key until the Span Calibration Screen (Screen 4) is displayed. Note and record on the log sheet the gas, span, wall and set SPAN values. Also, record the gas value on the log sheet at "Bscat Calculated Set Point". Then note the value at bscat and record this value on the log sheet as the Span Gas Initial Value. If the value is greater than 7% a span adjustment must be made later on as discussed in Section 4.3.
- 12) Turn off the R134 gas and remove the tubing from the purge port. Plug the stopper in the purge port and remove stopper from outlet port. Return the nephelometer to "SLOW" mode prior to sampling. Reconnect the ambient pump probe to the outlet port. Turn the ambient pump on.
- 13) Return to manufacturer and model identification screen. Reconnect the ambient probe and return the nephelometer to "SLOW" mode before resuming ambient air monitoring
- 14) Enable the data logger.
- 15) Summarize the weekly span QC checks on the Precision Check form.

5.2 Logbook Requirements

All stations are required to maintain site specific instrument logbooks. They are used as an official record for documenting all nephelometer operational and maintenance activities, any zero and span adjustments, quality control checks, site visits etc. The documentation will indicate the date and time of site visit. Also note the status condition and operating mode in the logbook. The operator will also indicate all activities such maintenance and QC checks that are performed in the logbook and operators initials. Keeping the logbook up to date is imperative for data validation requirements.

6 MAINTENANCE PROCEDURES

The M903 nephelometer requires little to no maintenance. During the weekly visit to the site, in Span Calibration Screen (Screen 4) record the value of “wall” in the logbook and field sheet. If this value exceeds 80% then the nephelometer needs cleaning and/or realignment of optics. At this point send the nephelometer in to the Monitoring Unit for repair.

7 DATA VALIDATIONS AND REPORTING OF DATA

This section discusses validations, documenting and reporting of the data. It is the policy of the Air Quality Program to provide the generation, storage and use of air monitoring data that meet prescribed precision, accuracy and data completeness criteria and is representative and comparable.

7.1 Data Assessment and Validation

Data must be validated to ensure that all reported measurements are accurate relative to the overall scope of the quality assurance program. The data validation process is based on specific criteria and when found to satisfy all the criteria, will be considered valid. The data that does not meet all the criteria will be invalidated.

The station operator will generate the preliminary, “Monthly Average Report” 1-hour running averages with flags. The Report will be reviewed for reasonableness and comparability.

1. Invalid data will be marked on the printout with an “X” through all-inclusive hours. These invalid data include periods of calibrations, QC activities, missing data, spiking, analyzer malfunctions, etc. Anomalous data periods will be reviewed and investigated with logbook entries, compared to other data parameters that maybe measured at the station, and any other tool available to ensure validity.
2. Submit the Report to the Quality Assurance Unit. All Reports must be submitted no later than the 10th of the following month. If the Report cannot be submitted on time notify the Quality Assurance Unit immediately and make arrangements for submittal.
3. The Quality Assurance Unit will review the Report, validate the data utilizing all Quality Control and Quality Assurance information, and then submit it to the Data

Management Unit for online editing. The Quality Assurance Unit will review and certify the final Report.

Table 7-1 Monthly Average Report

7.2 Final Data Validation and Data Reporting

Data that has been reviewed by the Quality Assurance Unit and found to satisfy the requirements of this procedure and the criteria defined in the Washington State Department of Ecology Air Monitoring Quality Assurance Plan will be certified as valid.

After the data are logged, edited, and validated, the AIRS Coordinator transmits the data to EPA.

8 DATA FORMS

Blank data forms are provided on the following pages for the convenience of the manual user. Please make copies as needed retaining the originals with the document.

Table -8-1 Calibration And Calibration Check Intervals

Activity	Frequency	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Acceptance Criteria
Zero Drift Check	Once in 10 days													Greater than -0.5E-5 and less than 0.5E-5
Span Check	Once in 10 days													Less than 7% from Bscat Calc. Set Pt.
Time	Once in 10 days													1 min/month
Zero Calibration	As needed													Greater than -0.5E-5 and less than +0.5E-5
Span Calibration	As needed													Less than 7% from Bscat Calc. Set Pt.
Wall	Once in 10 days													Less than 80%

Table 8-2 Nephelometer Zero/Span Log Sheet

Station Name: _____ Station Number: _____

Analyzer State Tag Number: _____ Analyzer S/N: _____

Shelter Temperature: Max _____ Min _____ Curr _____

Bscat Calculated Set Point (Gas) _____ Bscat P = _____ T = _____ Rh = _____

Initial Value

Adjusted Value

Clean Air Zero (Bscat) _____
(VDC) _____

Span Gas Bscat) _____
(VDC) _____

Screen #1 tc _____

Screen # 5 dark _____

mode _____

lamp _____

Screen #3 bscat _____

ref v _____

den _____

high v _____

zden _____

zero _____

Screen # 6 @STP _____

set ZERO _____ > _____

P _____

T _____

Screen #4 bscat _____

Rh _____

gas _____

set Rsct _____ > _____

span _____

Wall _____

Screen # 7 calgas/rayair ratio _____

set SPAN _____ > _____

set Rgas _____

Operator Notes:

Start check at _____ PST

End check at _____ PST

By: _____

Date: _____

Table 8-3 Air Monitoring Precision Checks

Washington Department of Ecology

AIRS SITE #:

5	3
---	---

 -

--	--	--

STATION#

--	--	--	--	--	--	--	--

 YEAR/MONTH: _____

ANALYZER STATE TAG #:

--	--	--	--	--	--	--	--

OPERATOR: _____ POLLUTANT: _____

LOCATION: _____

DATE			ACTUAL CONC.			INDICATED CONC.			UNITS	PASSED	COMMENTS
Month	Day	Year								Y or N	

PRECISION CHECK EQUIPMENT:

Cylinder Gas S/N: _____

*Decimal Placement

Neph 3 .XXX Bscat

Shaded areas to be completed by QA Personnel